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. Full name, address and postcode of the or of each applicant *(underline all surnames)*

Paul David Sherring

2 The Row
Hinton Waldrist
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Patents ADP number *(if you know it)*

If the applicant is a corporate body, give the country/state of its incorporation

4333229001

. Title of the invention

Electroluminescent position indicators and position indicator system for helmets

. Name of your agent *(if you have one)*

Hillgate Patent Services

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I/We request the grant of a patent on the basis of this application.

Signature Hillyate Peter Date 14th January 2003

Name and daytime telephone number of person to contact in the United Kingdom Steve Finch (020) 7704 9997

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# Electroluminescent position indicators and position indicator system for helmets

This invention relates to illuminated position indicators for use with helmets so as to warn others of the presence or position of the wearer.

Helmets are protective coverings worn on the head, either in the form of a hat or as part of a protective suit or the like. Examples include safety helmets for cyclists and motorcyclists, hard hats for builders or miners, airtight, watertight or pressure resistant headcoverings for divers or astronauts, and so forth.

It is often desirable for the user of a helmet to indicate his presence or position to others. For example, a cyclist must ensure that he can be seen by motorists, particularly in adverse conditions; miners must ensure that they are visible to their companions in case of accidents; and so forth.

It has accordingly been proposed to mount an illuminated position indicator or safety light on a safety helmet. For example, US 4,862,331 to Hanabusa discloses a safety light which is releasably attached to the rear of a motorcycle helmet. Electroluminescent lights have been found particularly suitable for use as safety lights, and US 5,327,587 to Hurwitz and US 5,559,680 to Tabanera for example disclose helmets with integral electroluminescent lights.

It is important however that the safety light forms an effective position indicator, particularly in difficult conditions, while not compromising the protective function of the helmet. For example, the weight and bulk of the safety light may compromise the balance of the wearer or the performance of the helmet in the event of an accident, while the protection afforded to the wearer may be reduced by the intrusion of safety light components into the shell of the helmet. It is accordingly the aim of the present invention to provide an improved position indicator and position indicator system which fulfil both of these requirements.

According to the present invention there is provided an electroluminescent position indicator, comprising a housing including a translucent portion and a base portion, an electroluminescent light source arranged within the housing and visible through the translucent portion, power supply means for powering the light source, and releasable attachment means for mounting the base portion on a helmet;

characterised in that the power supply means are contained within the housing.

The attachment means may be arranged so as to detach the indicator from the helmet in the event of an impact.

An illustrative embodiment of the invention will now be described by way of example and with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of a pair of position indicators according to the embodiment, in use on a cyclist's safety helmet;

Figs. 2A and 2B are respectively side and end views of one of the position indicators of Fig. 1;

Fig. 3 is an exploded view of Fig. 1 showing the attachment means;

Figs. 4 and 5 are top views of the indicators of Fig. 1 in use respectively on second and third helmets;

Fig. 6A is a cross section along line X – X of the position indicator of Figs. 2, with some internal components omitted for clarity;

Fig. 6B is a cross section of the seal of Fig. 6A;

Fig. 6C is a simplified cross section corresponding to Fig. 6A and showing an alternative form of seal;

Fig. 6D is a cross section corresponding to Fig. 6B and showing the alternative seal of Fig. 6C; and

Fig. 7 is a longitudinal section along line Y – Y of the position indicator of Figs. 2 showing the internal components.

Referring to Figs. 1, 2A and 2B, a pair of position indicators 10 are shown in use attached to opposite lateral sides 2 of a cyclist's safety helmet 1. Each indicator comprises an elongate housing or shell 11 with a translucent portion 12 and a base portion 13; conveniently the shell is formed from a translucent plastics material such as polycarbonate. The base portion conforms to the outer contour of the side portion 2 of the helmet on which it is mounted; the radius of curvature of the base portion 13 along its major axis is preferably between 90 mm and 490 mm, and this is found in practice to be suitable for attachment to a wide variety of commonly available helmets. The interior of the housing 11 may be enclosed at its base portion 13 by a base plate (not shown), on which the attachment means may be mounted, and may be watertight and pressure resistant, enabling the indicators 10 to be used by divers.

A flexible seal 14 (shown in particular in Fig. 6B) is provided on the base portion, which deforms to accommodate differences between the contours of the base portion 13 and the helmet 1 to which the indicator is attached. Depending on the contours of the helmet, the seal may also resist the ingress of water into the junction between the indicator and the helmet, improve streamlining and prevent looseness and vibration during use. An alternative form of seal is shown in Figs.

6C and 6D; Fig. 6C shows an alternative form of housing and part of a baseplate, the baseplate and housing cooperating to retain the seal.

Referring to Fig. 3, each indicator 10 is equipped with releasable attachment means for mounting the base portion 13 on the helmet 1. Conveniently, the attachment means comprise cooperating pairs of slim magnetic elements, which may be disc shaped as shown in the figures, or alternatively for example may be elongate. Each element is preferably a magnet, as pairs of magnets are found in practice to give the most satisfactory attachment. One element 30 of each pair is attached to the outer covering of the helmet, for example by gluing or welding, and the other (not shown) is arranged within the base portion 13 of the housing 11. Where the element 30 is glued to the helmet, a cyanoacrylate or other adhesive is preferably chosen so as not to adversely affect the plastics shell of the helmet.

Alternatively each pair of elements may comprise a magnet and a steel element; the steel element may be formed by the outer shell of a steel helmet, or by a steel baseplate (not shown) enclosing the base portion of the housing 11.

In use, the base portion 13 is pressed into position so that the cooperating elements attract each other, and the indicator 10 is firmly held against the side of the helmet 1. The indicator 10 may thus be removed cleanly and quickly by grasping it firmly and twisting it away from the helmet, and thereafter reattached to any helmet which is equipped with suitable magnetic elements (including a steel helmet).

In a development, one element of each pair is flexibly attached to the base portion 13, for example by moulding the element into part of the seal 14. The element and seal 14 may be shaped differently from those illustrated. This allows the element to more perfectly align itself with the cooperating element on the surface of the helmet so as to achieve a more positive attachment.

Equivalent attachment means for heavy duty applications will be readily apparent. For some applications, such as builders' or miners' helmets for example, the attachment means may be threaded studs with wingnuts or the like, which ensure that the indicators remain firmly attached in the event of an impact.

However, for other applications, especially cyclists' and motorcyclists' safety helmets, the bulk of the indicator could prevent the helmet from rolling smoothly on the ground in the event of the user falling from the bicycle or motorcycle, resulting in a wrench to the user's neck. It is therefore very important for these applications that the attachment means detach the indicator, and all of its associated power supply components, reliably and instantly in the event of an impact, and this is achieved by the incorporation of the power supply components into the housing, together with the use of suitable releasable, preferably magnetic, attachment elements as described.

In particular, the absence of any restraining element encircling the helmet or substantially protruding from the helmet ensures that the indicators automatically detach themselves cleanly and reliably, enabling the helmet to roll as designed. This ensures that the presence of the indicators does not compromise the performance of the helmet in the event of an accident.

Alternatively, equivalent cleanly releasing attachment elements may be used to secure the housing to the helmet. For example, press studs or replaceable frangible elements which are designed to fracture under a specified load might be employed in place of the magnetic elements. Magnetic elements as described are however particularly preferred due to the absence of any component substantially protruding from the helmet subsequent to the detachment of the housing, and because magnetic elements as described achieve particularly reliable detachment under designed conditions.

Referring to Figs. 4 and 5, the indicators 10 are preferably attached in pairs to opposite lateral sides of the helmet so that both indicators are visible together, depending on the position of the observer. The position indicator system thus formed according to the invention thus provides a balanced, symmetrical arrangement which does not compromise the balance of the helmet and hence the safety of the wearer. This is particularly important in the case of lightweight helmets, such as those worn by cyclists. Preferably the two sides of each indicator are symmetrical as shown about its major axis so that each indicator may be used on either the right or the left side of the helmet, each of the two sides of the indicator then being respectively either uppermost or downmost.

The translucent portion 12 of each indicator forms an elongate band which extends along the side of the helmet from its front part 3 to its back portion 4. This arrangement ensures that the indicators 10 are effective in use, particularly in situations where it is important that the user's presence or position should be clearly visible from the side, such as where the user is a cyclist or motorcyclist riding in conditions of poor visibility and must be clearly seen from the side by motorists who might otherwise manoeuvre into his path. The elongate band of light provided by the indicators 10 gives a clear indication of the presence of the user from each side, in addition to being visible from ahead and behind, and thus offers significant advantages over lights which are visible only from ahead of or behind the user.

The elongate shape of the housing as shown in the figures also streamlines the indicator and minimises drag, which is particularly desirable when the indicator is in use by a cyclist, diver or motorcyclist.

The outwardly extending translucent housing of each indicator ensures that the indicator is visible from a wide angle of view, and from above and below as well as to either side, while its elongate shape is easily recognisable, particularly in difficult conditions such as where there is a confusion of point sources of light.

By arranging the pair of indicators on opposite sides of the helmet so that both are visible together, the further advantage is realised that an observer may deduce from the orientation and relative positions of the indicators not only the position but also the orientation and hence the likely direction of movement of the user. Similarly, the observer may deduce the user's field of vision and hence determine whether or not the user is aware of the presence of the observer, or of some impending danger.

In this connection it will be noted that the front end 15 of each indicator 10, which in use is arranged towards the front part 3 of the helmet, is desirably visually distinct from its rear end 16, arranged at the rear end 4 of the helmet. Referring also to Fig. 2A, the distinctive shape of the indicator is visible from above and from the side, and the shape and location of the electroluminescent strips (as further described below) may also be arranged so as to enhance the distinctiveness of the two ends of the indicator.

The distinctiveness of the front and rear ends of each indicator, both when observed from in front, behind or to one side of the wearer, and also when seen from above, thus further assists the observer (for example, where the indicators are in use underwater on a diver's helmet) to determine the orientation and direction of movement of the wearer of the helmet. This helps to solve the problem of limited communication between individuals in situations of poor visibility, and makes the indicators more effective in conveying safety critical information about the wearer to his companions.

Referring to Figs. 6A and 7, an electroluminescent light source together with power supply means are arranged within the housing 11. The light source includes an elongate electroluminescent plastics strip 60 of known type, which is preferably attached to the inner surface 17 of the outer portion 18 of the housing so that it runs the full length of the housing and is directly visible through it. A

transparent window 19 is preferably formed adjacent the strip 60 so that the strip is directly visible through the transparent section; the remainder of the translucent portion 12 may be nontransparent, having for example a frosted internal surface, so that the light is diffused through it. An intense strip of light is thus surrounded by a more diffuse area of light.

A second elongate electroluminescent strip 61 may be arranged adjacent the base portion 13 along one or both sides of the housing, and a transparent window portion may again be formed in the translucent section adjacent the second strip. The position of the second strip is shown by a broken line in Fig. 7. A reflector 62 is arranged within the housing 11 between the light source 60, 61 and the power supply means 70, 71, 72, and extends substantially away from the base portion 13 so as to define a cavity which contains the power supply means 70, 71, 72.

Surprisingly, it is found that by using a power supply including a relatively low voltage battery and a suitable self-oscillating inverter with an input voltage of 3V or less and a transformer output, it is possible to supply adequate power to the light source to ensure good intensity of illumination for up to 15 hours or more of continuous use, while still achieving a compact and lightweight assembly. Preferably therefore the transformer output includes a miniature coil or transformer 71, which is formed with an elongate shape so as to fit within the cavity in the reflector, together with inverter circuitry 72 as known in the art, and a relatively low voltage battery 70, such as a 3V or 1.5V battery. Alternatively two or more batteries may be used.

Alternatively, the power supply means may be arranged to run on an input voltage of 12V or less.

By arranging the inverter to run at an unusually low input voltage, it is possible to power it from a relatively compact, cheap and readily available, low voltage battery, such as a 1.5V or 3V battery, or alternatively for example a small 5V or

12V battery. This enables the battery and other power supply components to be contained entirely within the housing 11, while realising the further advantage that suitable batteries are easy to find and inexpensive to replace.

The housing 11 is preferably equipped with a base plate (not shown) which seals the housing at its base portion 13, preventing the ingress of water. The base plate may render the housing watertight and pressure resistant, enabling the indicator to be used by divers.

The base plate may incorporate a compartment containing the battery 70, sealed off from the interior of the housing and incorporating a removable, watertight and pressure resistant lid enabling the battery to be removed and replaced from the outside. The baseplate may be formed as a single moulded plastics component, on which the power supply components are first assembled before sealing it (for example by ultrasonic welding or adhesive) to the lower margin of the housing 11. Alternatively it may be moulded integrally with the housing, the housing being formed in two parts which are ultrasonically welded together after assembly of the internal components.

Alternatively the power supply components, magnetic elements and battery compartment may be potted in resin which fills the cavity beneath the reflector, sealing the lower margin of the housing, so that the surface of the resin forms the baseplate.

It is found in practice that the light from the electroluminescent strip is less dazzling and hence more effective as a position indicator than that from a conventional filament lamp. An electroluminescent light source is also found in tests to be more easily visible in fog than a conventional light source designed for external illumination, and hence is preferred for use in a position indicator. These advantages are particularly apparent in difficult conditions – for example where there is a confusion of point sources of light, where light is diffracted by fog, or in

reduced visibility conditions such as may be encountered when diving – and are enhanced by the combination of a high intensity, but nevertheless not dazzling band of light, bordered by a more diffuse area of light, as described above.

It is found that by using electroluminescent illumination and integrating the power supply components into the housing, the indicator is sufficiently compact and light in weight that it does not compromise the normal performance of the helmet, such as a cyclist's helmet, to which it is attached. At the same time, by placing the power supply means within the housing, the disadvantage of intrusion of lighting components into the body of the helmet, which may impair its protection, is avoided.

In summary, a position indicator for a helmet, for example for a cyclist or a diver, comprises a translucent housing containing one or more electroluminescent strips together with a power supply, which preferably includes a low voltage inverter with a transformer output. The indicator is releasably attached to the helmet, and may detach in the event of an accident so as not to impair the normal function of the helmet. The housing forms an illuminated band extending along the side of the helmet; the front and rear ends of the indicator may be distinguished from each other. A position indicator system comprises two indicators arranged symmetrically on either side of the helmet, so as to indicate the orientation of the wearer.

In alternative embodiments the housings need not be elongate, and the electroluminescent light source, and other aspects of the invention, may be formed other than as described above. It is to be understood therefore that the invention is not limited to the embodiments described, and many further advantages will become apparent upon reading the foregoing description and studying the drawings.

# CLAIMS

1. An electroluminescent position indicator,

comprising a housing including a translucent portion and a base portion,

an electroluminescent light source arranged within the housing and visible through the translucent portion,

power supply means for powering the light source,

and releasable attachment means for mounting the base portion on a helmet;

characterised in that the power supply means are contained within the housing.

2. An electroluminescent position indicator according to claim 1, characterised in that the housing is elongate and the base portion has a radius of curvature between 90 mm and 490 mm so as to conform to the outer contours of a side portion of the helmet.

3. An electroluminescent position indicator according to claim 1 or claim 2, characterised in that the attachment means are arranged so as to detach the indicator from the helmet in the event of an impact.

4. An electroluminescent position indicator according to any preceding claim, characterised in that the translucent portion forms an elongate band with a front end and a rear end, and in use the band extends along a side portion of the helmet such that the front end is adjacent a front portion of the helmet, and the rear end is adjacent a rear portion of the helmet.

5. An electroluminescent position indicator according to claim 4, characterised in that in use the front end is visually distinct from the rear end.

6. An electroluminescent position indicator according to any preceding claim, characterised in that a reflector is arranged within the housing between the light source and the power supply means, and the reflector extends substantially away from the base portion so as to define a cavity, and the power supply means are arranged within the cavity.

7. An electroluminescent position indicator according to any preceding claim, characterised in that the translucent portion comprises a shell having an inner surface, and including an outer portion distant from the base portion; and the light source includes a first elongate electroluminescent element attached to the inner surface of the outer portion such that in use it is directly visible through the outer portion.

8. An electroluminescent position indicator according to claim 7, characterised in that the light source includes at least one second elongate electroluminescent element arranged adjacent the base portion.

9. An electroluminescent position indicator according to claim 7 or claim 8, characterised in that the translucent portion includes a nontransparent section which diffuses the light from the light source, and a transparent section, and the first electroluminescent element is directly visible through the transparent section.

10. An electroluminescent position indicator according to any preceding claim, characterised in that the power supply means includes an inverter with a transformer output.

11. An electroluminescent position indicator according to claim 10, characterised in that the transformer output includes an elongate coil.

12. An electroluminescent position indicator according to claim 10 or claim 11, characterised in that the power supply means operates on an input voltage of 12V or less.

13. An electroluminescent position indicator according to claim 10 or claim 11, characterised in that the power supply means operates on an input voltage of 3V or less.

14. An electroluminescent position indicator according to any preceding claim, characterised in that the attachment means includes cooperating magnetic elements associated respectively with the housing and with the helmet.

15. An electroluminescent position indicator according to any preceding claim, characterised in that the base portion includes a flexible seal which in use conforms to the contours of the helmet.

16. An electroluminescent position indicator according to any preceding claim, characterised in that the housing is watertight and pressure resistant.

17. A position indicator system for a helmet,

the system comprising a pair of electroluminescent position indicators according to any previous claim,

characterised in that the indicators are arranged respectively on opposite lateral sides of the helmet.

## ABSTRACT

**Electroluminescent position indicators and position indicator system for helmets**

A position indicator for a helmet, for example for a cyclist or a diver, comprises a translucent housing containing one or more electroluminescent strips together with a power supply, which preferably includes a low voltage inverter with a transformer output. The indicator is releasably attached to the helmet, and may detach in the event of an accident so as not to impair the normal function of the helmet. The housing forms an illuminated band extending along the side of the helmet; the front and rear ends of the indicator may be distinguished from each other. A position indicator system comprises two indicators arranged symmetrically on either side of the helmet, so as to indicate the orientation of the wearer.

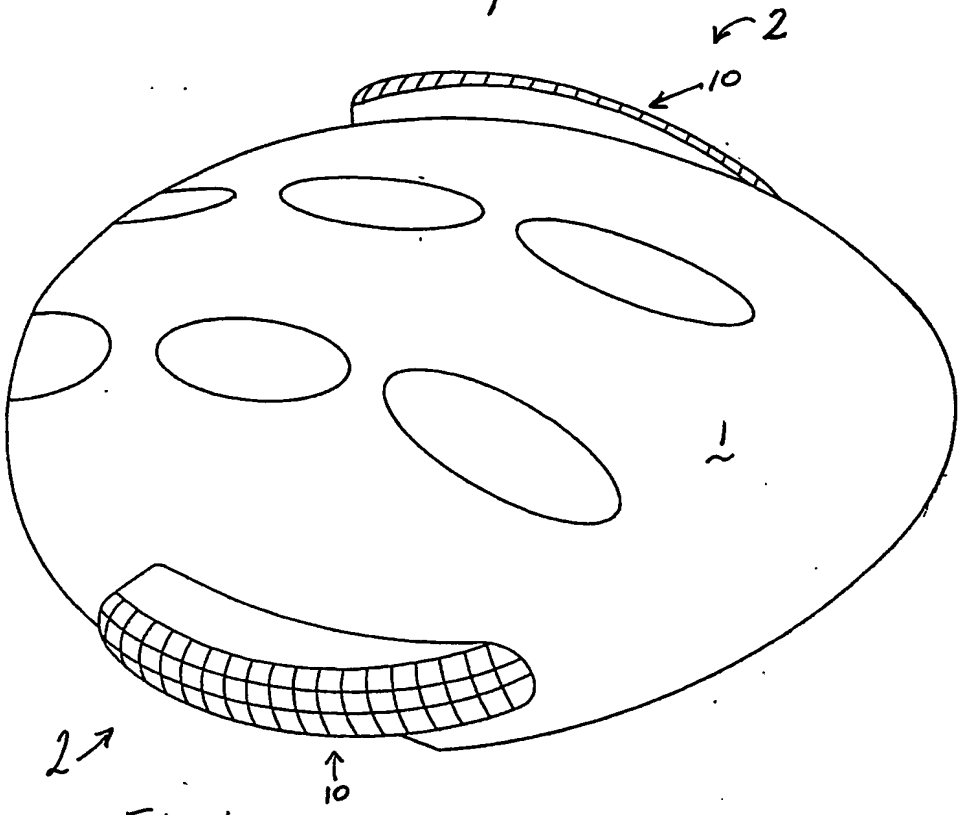


FIG. 1

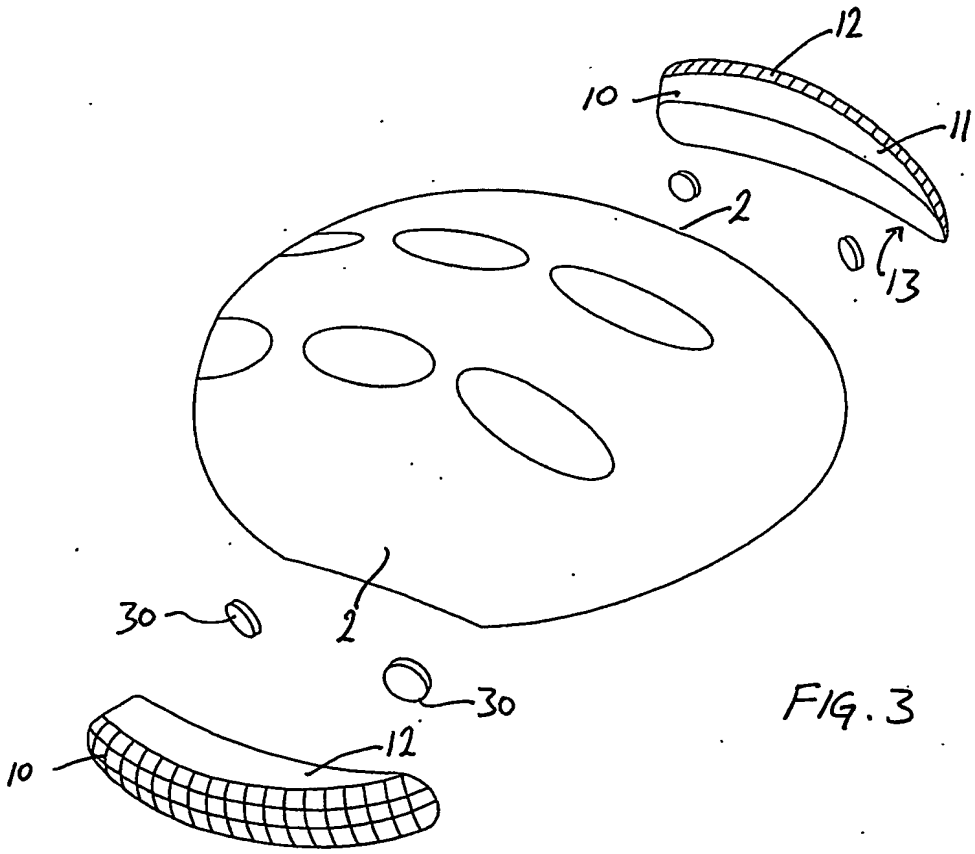


FIG. 3

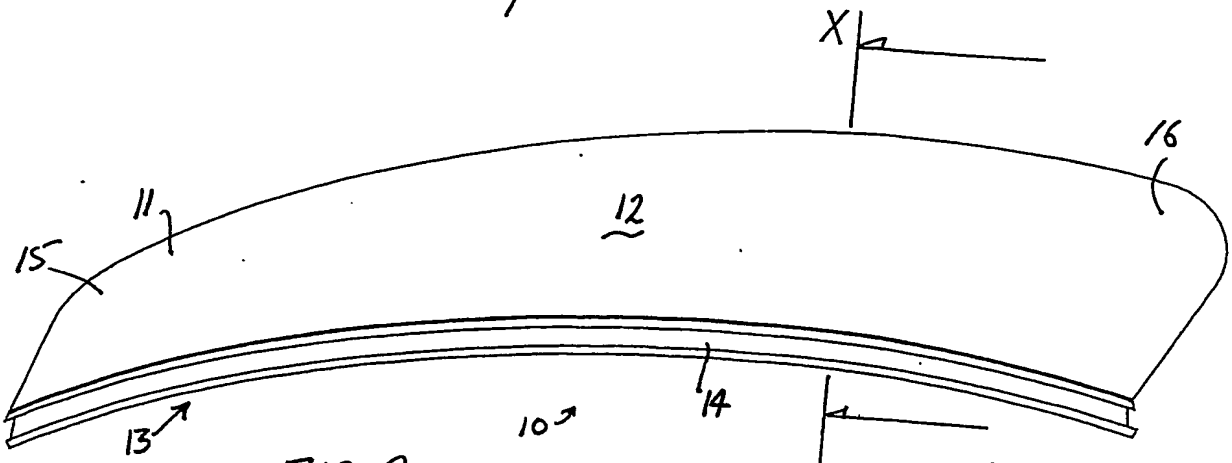


FIG. 2A

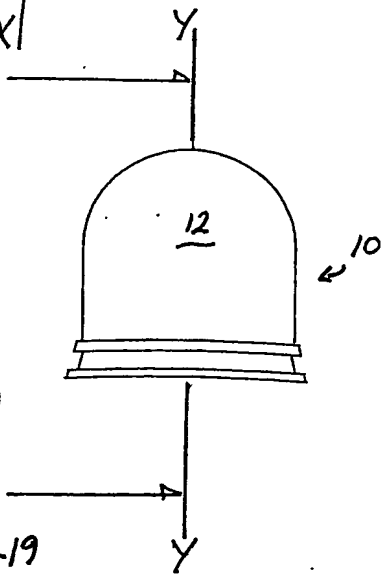


FIG. 2B

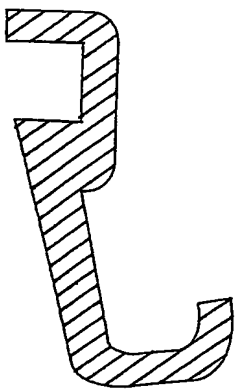

FIG. 6B

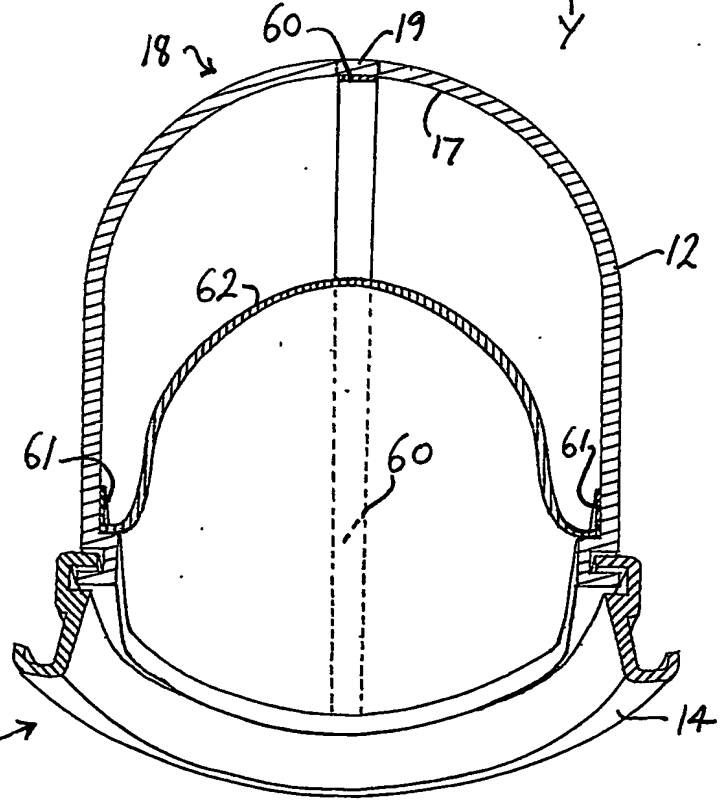


FIG. 6A

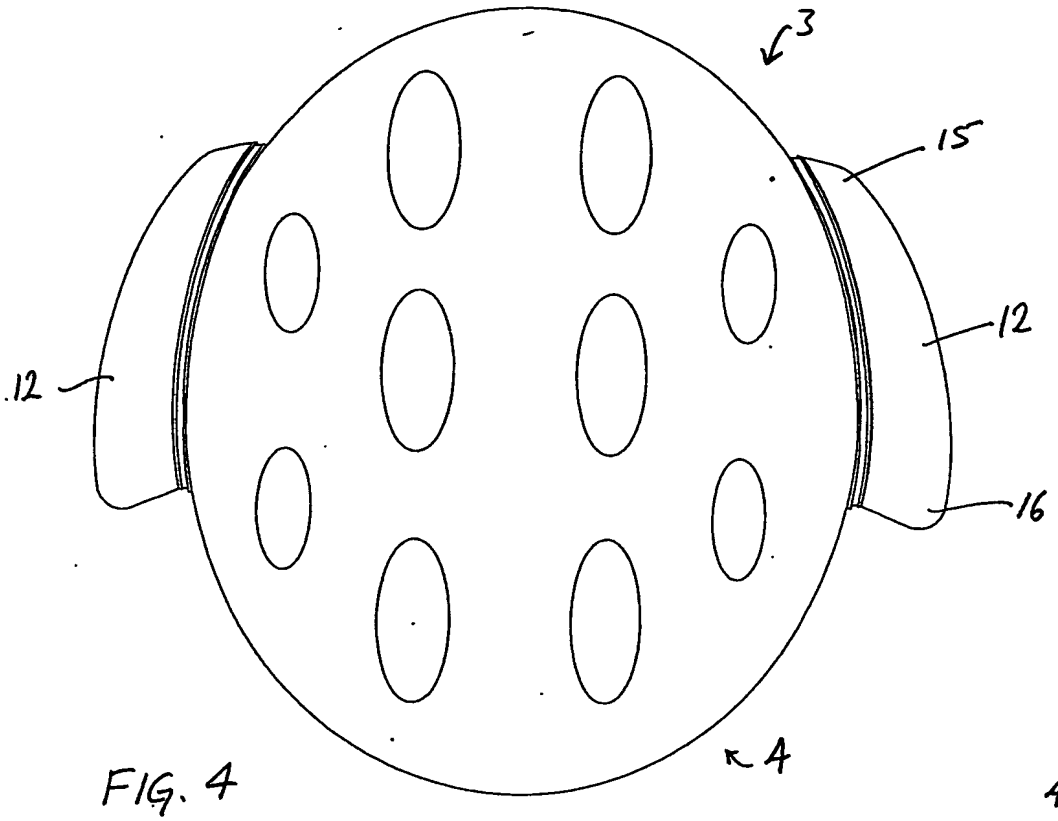


FIG. 4

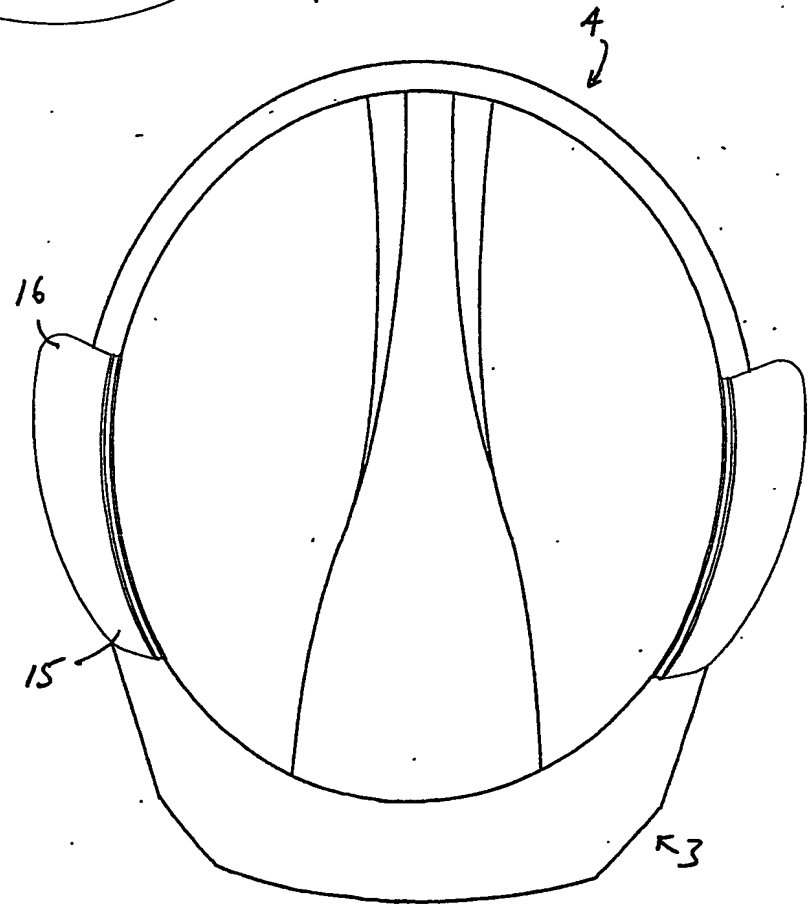


FIG. 5

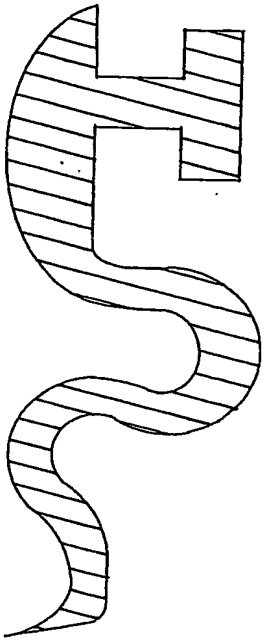

FIG. 6D

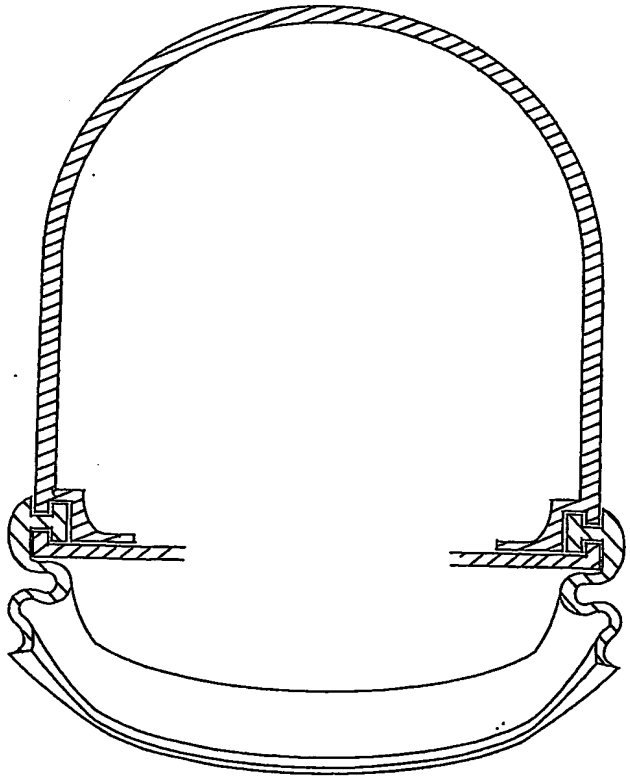

FIG. 6C

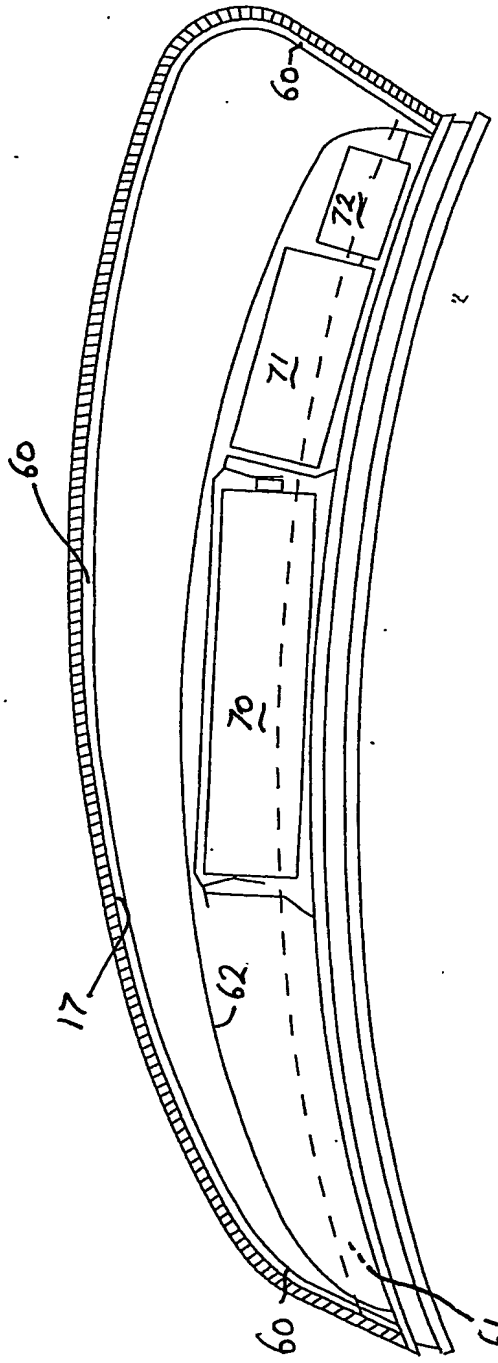


FIG. 7

PCT Application

PCT/GB2004/000090